

Centri-Clean Meeting Minutes

(Week 7)

Date: Thursday, October 22, 2015, 11:30-12:30 pm

Attendance:

Dr. Tao Xing
Dr. Behnaz Rezaie
Josie Flerchinger
Garrett Hall
Travis Soderquist
Mr. Wayne Moody

Location: ME Conference Room

Minutes: Josie Flerchinger/Travis Soderquist

Old Business:

- Purchasing of Sensor
 - Sensor purchased on 10/16/15
 - From InstruMart in Vermont
 - Cost: \$779.00
 - Vortex Tube
 - Prove concept works, no need for full separation of gases
 - Modifications to tube
 - Conical end to allow for higher g force towards bottom
 - Extend inner tube above tube cap and add in another outlet for the heavy phases to escape
 - Use two designs
 - 1) Mesh bottom cap
 - Allows heavy phases to escape
 - 2) Solid bottom with line of “grater” like holes horizontally around center of bottom cap
 - Holes allow the escape of heavy phases
 - Finalize dimensions
 - Base equations off of dissertation paper, “Theory of Cyclone Design” by Lingjuan Wang-Li
 - Create Excel sheet for equations
 - Create solid model of design
 - Prototype should be built by 10/22/15
 - Simplified Disk Design

Centri-Clean Meeting Minutes

Date: Thursday, October 29, 2015, 11:30-12:30 pm

Attendance:

Dr. Tao Xing
Josie Flerchinger
Garrett Hall
Travis Soderquist
Jake Gilles

Location: ME Conference Room

Minutes: Josie Flerchinger/Travis Soderquist

Old Business:

- Purchasing of Sensor
 - Sensor has not arrived
- Vortex Tube
 - Prove concept works, no need for full separation of gases
 - Modifications to tube have been made
 - Finalize dimensions
 - Contacted Russ at the Uofl machine shop, said the original dimensions will be very costly and difficult to make.
 - Original dimensions are too small to fabricate in house.
 - Suggested scaling dimensions by 4, so the smallest diameter is 3 inches, which is the smallest roller size the university has.
 - Russ agreed scaling the model by 4 would make the prototype less costly and able to be made in house.
 - Need to figure out how cap can be made.
 - Uofl shop cannot fabricate the cap end.
 - Suggested buying a nozzle and then altering it to meet our design needs.
 - Compressor
 - If new dimensions of tube are adapted, a compressor capable of ~50cfm is needed to reach the ~60m/s from the equations obtained from the "Theory of Cyclone Design" dissertation.
 - Prototype
 - Work order can be sent in as soon as dimensions are finalized.
 - Aiming for order to be sent in by Friday (10/30) (pending)

Centri-Clean Meeting Minutes

Date: Thursday, November 5, 2015, 11:30-12:30 pm

Attendance:

Dr. Tao Xing
Josie Flerchinger
Garrett Hall
Travis Soderquist
Jake Gilles

Location: ME Conference Room

Minutes: Josie Flerchinger/Travis Soderquist

Old Business:

- Purchasing of Sensor
 - Sensor arrived on November 3rd
- Vortex Tube
 - Team-Designed model was abandoned
- Simplified Disk Design
 - Dimensions are still being calculated.
 - Compressor
 - Find details of gas compressor
 - Talk to Scott at Energy Plant
- CFD
 - CFD license expired, no new CFD results for this week.
- Wiki Page
 - Completed up to this point in time
- Idaho Pitch
 - Team has sent in their application to participate in this contest

New Business

- Project Design Review
 - Must be completed by Nov. 20th
 - Work on scheduling a date
- Running CFD simulation
 - Using higher RPM's
 - Using disk diameter of 1 meter
- Vortex Tube

Centri-Clean Meeting Minutes

Date: Thursday, November 12, 2015, 12:00-12:45 pm

Attendance:

Dr. Tao Xing
Garrett Hall
Travis Soderquist
Jake Gilles
Scott Smith
Dr. Beth Rezaie

Location: ME Conference Room

Minutes: Josie Flerchinger/Travis Soderquist

Old Business:

- Idaho Pitch
 - The pitch is (11/12/15)
- Project Design Review is now scheduled for Thursday, November 19 at 11:30 a.m.
- Simplified Disk
 - Continue working on finishing design
- Vortex Tube
 - Look into buying an off the shelf vortex tube
 - Create system diagram of how to get flue gas to the vortex tube
 - Look into gas compressors, heat exchangers, and accumulation tanks

New Business

- Purchase a vortex tube
- The steam plant has a compressor, accumulation tank, and possible heat exchangers for our team to use

Action Items

- Complete simplified disk
- Heat exchanger calculations
- Decide on purchasing equipment
- Complete designs for the design review

Centri-Clean Meeting Minutes

Date: Thursday, November 19, 2015, 11:30-12:30 pm

Attendance:

David McCutchen
Dr. Tao Xing
Garrett Hall
Travis Soderquist
Josie Flerchinger
Jake Gilles
Scott Smith
Dr. Beth Rezaie

Location: ME Conference Room

Minutes: Josie Flerchinger/Travis Soderquist

Old Business:

- Project Design Review
 - Completed 11/19/15
- Simplified Disk
 - First draft completed
 - Drawing package was sent out
- Vortex Tube
 - Create system diagram of how to get flue gas to the vortex tube/disk
 - Look into gas compressors, heat exchangers, and accumulation tanks

New Business

- Refine disk design in order to purchase materials and fabricate
- Vortex tube purchased (11/19)
 - Model #20400 for \$356.76
 - Using U of I's energy plant gas compressor, accumulation tank and heat exchanger
- Testing
 - Begin testing as soon as vortex tube arrives

Action Items

- Test vortex tube after fall break
- Contact shop personnel to see if we can machine disk design over Christmas break
- Determine/purchase materials for simplified disk
- 2 phase CFD simulation
- Refine G force calculations for vortex tube

Centri-Clean Meeting Minutes

Date: Thursday, December 3, 2015, 11:30-12:30 pm

Attendance:

Dr. Tao Xing
Garrett Hall
Travis Soderquist
Josie Flerchinger
Jake Gilles
Dr. Beth Rezaie

Location: ME Conference Room

Minutes: Josie Flerchinger/Travis Soderquist

Old Business:

- Project Design Review
 - Completed 11/19/15
- Simplified Disk
 - First draft completed
 - Drawing package was sent out
- Vortex Tube
 - Sensor arrived
 - Using U of I's energy plant gas compressor, accumulation tank and heat exchanger

New Business

- Snapshot presentation
 - Friday 8:30-10:30am in GJ Power Lab
- Disk
 - Refine disk design in order to purchase materials and fabricate
- Vortex Tube Testing
 - Need to design piping plan to hook up assembly
 - Coordinate with Scott
 - Need to find temperature and flow rate out of heat exchanger
 - Ask Dr. He if he has anemometer we can borrow
 - Anemometer can also be used to find flow rates going in and out of vortex tube
 - Our AMPRO sensor can measure the temperature
 - Begin testing next week
 - G force calcs

Centri-Clean Meeting Minutes

Date: Thursday, December 10, 2015, 11:30-12:30 pm

Attendance:

Dr. Tao Xing
Garrett Hall
Travis Soderquist
Josie Flerchinger
Jake Gilles
Dr. Beth Rezaie

Location: ME Conference Room

Minutes: Josie Flerchinger/Travis Soderquist

Old Business:

- Simplified Disk
 -
- Vortex Tube
 - Design plan needs to be coordinated with Scott
 - AMPRO meter will be used for temperature reading
 - Need a way to measure the flow rate
- CFD Simulation
 - Simulation was ran with 2 phases
 - Having the extra outlet caused a pressure difference between the outlets, therefore the flow did not separate and just went out one outlet
 - New simulation will be ran with outlet pressures changed
- End of Semester Deliverables
 - Not turning in logbooks/portfolio until next semester
 - Compile files from this semester and upload to Google Drive and also send via email to Dr. Xing and Dr. Rezaie
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New Business

- Disk
 - Off the shelf parts ordered from Grainger
 - Materials for fabrication need to be ordered
- Vortex Tube Testing
 - Need to find temperature and flow rate out of heat exchanger
 - Dr. He does not have anemometer for us to borrow
 - Need to look into buying one

Centri-Clean Meeting Minutes

Date: Thursday, January 14, 2016, 11:00-12:00 pm

Attendance:

Dr. Tao Xing
Garrett Hall
Travis Soderquist
Josie Flerchinger
Dr. Beth Rezaie
Scott Smith

Location: ME Conference Room

Minutes: Josie Flerchinger/Travis Soderquist

Old Business:

- Simplified Disk
 - All ordered parts have arrived
- Vortex Tube
 - Basic design setup completed

New Business

- Vortex Tube Testing
 - Buy remaining fittings in order to use analyzer
 - Coordinate with Scott for testing dates
 - Look into NO_x/SO_x cartridges for Vorsana's gas sensor
 - Waiting on pressure and flow meters to arrive
- CFD Simulation
 - Simulation was ran with 2 phases separation was minimal
 - Next simulations will vary temperatures, viscosity, and rpm <6000-7000
 - Simulation window will change from rectangular to cylindrical to help reduce stagnation points
- Theoretical analysis of current industrial gas separations
 - Look into electrostatic precipitators
 - Look into gas/solid particulate bonding
- Analyze geometry of vortex tube flow restrictor valve to better understand velocity inside vortex tube

Action Items

- Determine/purchase materials for simplified disk
- 2 phase CFD simulation with changed variables
- Purchase fittings
- Research theoretical analysis
- Confirm vortex tube velocities

Centri-Clean Meeting Minutes

Date: Thursday, January 21, 2016, 11:20-12:15 pm

Attendance:

Dr. Tao Xing
Garrett Hall
Travis Soderquist
Josie Flerchinger
Dr. Beth Rezaie
Scott Smith
Jake Gilles

Location: ME Conference Room

Minutes: Josie Flerchinger

Old Business:

- Vortex Tube
 - Basic design setup completed
 - Pressure and flow meters have arrived
 - Fittings were bought to allow testing while our fittings are being printed

New Business

- Vortex Tube Testing
 - Fittings
 - Garrett will be 3D printing a fitting for the hot end
 - Testing
 - The team's sensor was not working properly so CO₂ concentrations were not obtained
 - Second test using IAC's gas analyzer
 - Did not show any significant separation
 - No separation could be caused by lack of seals (we used duct tape for time being)
 - Coordinate with Scott for future testing dates
- CFD Simulation
 - Simulation was ran with improper boundary conditions
 - Still had the problem of velocity retardation in the rectangular configuration
 - New simulation simulating the actual vortex tube will be next
- Theoretical analysis of current industrial gas separations
 - Density, temperature and pressure of molecules were researched
 - Research on the effects of adding particles (fly ash) into the gas mixture will help increase velocity and therefore separation
 - Research is ongoing for enhanced separation methods

Centri-Clean Meeting Minutes

Date: Thursday, January 28, 2016, 11:20-12:20 pm

Attendance:

Dr. Tao Xing
Garrett Hall
Travis Soderquist
Josie Flerchinger
Jacob Gilles
Dr. Beth Rezaie
Scott Smith

Location: ME Conference Room

Minutes: Josie Flerchinger/Travis Soderquist

Old Business:

- Vortex Tube
 - Basic design setup completed
 - Pressure and flow meters implemented
 - Fittings were bought to allow testing while our fittings are being printed

New Business

- Vortex Tube Testing
 - Compare the sensors to see what relationship they have
 - Optimize testing setup for best results

Action Items

- Design review scheduling
- Improve/add another accumulation tank for increased continual flow

Centri-Clean Meeting Minutes

Date: Thursday, February 4, 2016, 11:20-12:20 pm

Attendance:

Dr. Tao Xing
Garrett Hall
Travis Soderquist
Josie Flerchinger
Jacob Gilles
Dr. Beth Rezaie
Scott Smith

Location: ME Conference Room

Minutes: Josie Flerchinger/Travis Soderquist

Old Business:

- Vortex Tube
 - Basic design setup completed
 - Pressure and flow meters implemented
 - IAC meter is 1-1.1% higher than AMPRO meter

New Business

- Vortex Tube Testing
 - No significant separation has been achieved with the current set up
 - Accumulation tank was added to the system
 - Flow rates are still low, but company is being contacted to figure if rated flows are true.
- Design Review
 - Scheduled for February 11th at 11:20am

Action Items

- Inquire about gas sample analysis
- Ask Uofl faculty if there is a portable gas analyzer for nitrogen
- Read new research papers Dr. Xing sent out and research further for more information

Centri-Clean Meeting Minutes

Date: Thursday, February 18, 2016, 11:20-12:20 pm

Attendance:

Dr. Tao Xing
Garrett Hall
Travis Soderquist
Josie Flerchinger
Dr. Beth Rezaie

Location: ME Conference Room

Minutes: Travis Soderquist

Old Business:

- Vortex Tube
 - Testing produced no separation

New Business

- Modeling from Research Papers
 - Continue theory summary from journal papers
 - Translate equations to estimate disk model parameters for separation
- Disk Model
 - Begin building and assembly
 - Possible solution to the p.m. 2.5 issue
- Analyzing Gas Components
 - Working with a private lab to determine if sending them a sample is an option
 - Talking to professors about possible gas analyzers on campus

Action Items

- Inquire about gas sample analysis
- Work with UI faculty to locate a possible gas analyzer for nitrogen
- Theoretical modeling using vortex tube equations to transfer to the simplified disk model
- Start building/assembling simplified disk model

Centri-Clean Meeting Minutes

Date: Thursday, February 25, 2016, 11:20-12:20 pm

Attendance:

Dr. Tao Xing
Garrett Hall
Travis Soderquist
Josie Flerchinger
Dr. Beth Rezaie

Location: ME Conference Room

Minutes: Josie Flerchinger/Travis Soderquist

Old Business:

- Vortex Tube
 - Testing produced no separation
- Analyzing Gas Components
 - Can send gas sample into ALS lab.
 - Found new meter at the U of I

New Business

- Modeling from Research Papers
 - Continue velocity calculations
- Disk Model
 - Finalize design
 - Coordinate with shop manager and team mentor to start fabrication
- Analyzing Gas Components
 - Determining which is more feasible: shipping gas sample to ALS lab or making Testo analyzer operational

Action Items

- Price list for maintenance on Testo 350 analyzer
- Contact ALS environmental for cost of testing
- Finalize disk design
- Coordinate with shop manager and team mentor to start fabrication

Centri-Clean Meeting Minutes

Date: Thursday, March 3, 2016, 11:20-12:20 pm

Attendance:

Dr. Tao Xing
Dr. Beth Rezaie
Scott Smith
Garrett Hall
Josie Flerchinger
Travis Soderquist

Location: ME Conference Room

Minutes: Josie Flerchinger/Travis Soderquist

Old Business:

- Modeling from Research Papers
 - Continue velocity calculations
- Price list for maintenance on Testo 350 analyzer
 - Too expensive for our team's budget
- Purchased Dylos p.m. 2.5 sensor

New Business

- Disk Model
 - Finalize design
 - Coordinate with shop manager and team mentor to start fabrication
 - Order remaining parts
- Analyzing Gas Components
 - Collect flue gas to ship to ALS for analyzing
 - Determine how to dry the gas for the NO₂/NO test
- Snapshot March 8th

Action Items

- Finalize disk design
- Coordinate with shop manager and team mentor to start fabrication
- Create tentative schedule for simplified disk manufacture/assembly
- Finalize purchases for simplified disk
- Determine way to dry flue gas samples
- Send gas samples to ALS for testing

Centri-Clean Meeting Minutes

Date: Thursday, March 24, 2016, 11:30-12:15 pm

Attendance:

Dr. Tao Xing
Dr. Beth Rezaie
Garrett Hall
Josie Flerchinger
Travis Soderquist

Location: ME Conference Room

Minutes: Josie Flerchinger

Old Business:

- Disk Design
 - Finalize design
 - Coordinate with shop manager
 - Order parts
- Gas Analyzation
 - Flue gas has been collected and sent to labs

New Business

- Disk Model
 - Parts have arrived.
- Analyzing Gas Components
 - Calculate theoretical value for CO₂
 - Contact Lab to verify results and for NO and NO₂ results

Action Items

Centri-Clean Meeting Minutes

Date: Thursday, March 31, 2016, 11:30-12:15 pm

Attendance:

Dr. Tao Xing
Dr. Beth Rezaie
Garrett Hall
Josie Flerchinger
Travis Soderquist

Location: ME Conference Room

Minutes: Josie Flerchinger

Old Business:

- Disk Design
 - Finalize design
 - Coordinate with shop manager
 - Order parts
- Gas Analyzation
 - Flue gas has been collected and sent to labs

New Business

- Disk Model
 - Parts have arrived.
 - Check with Russ for proper fasteners
 - Manufacturing has begun
- Analyzing Gas Components
 - Measure CO₂ with gas analyzer the team has
 - Contact Lab to verify results for NO and NO₂ and CO₂ results

Action Items

Call Lab-Josie
Verify fastener choice with Russ-Garrett